REMARKS

Introduction

In response to the Office Action dated March 18, 2008, Applicants have amended claims 1 and 3. The limitations of claim 7, previously dependent upon claim 1, have been incorporated into claim 1, and claim 7 cancelled. Support for amended claim 1 is found in, for example, Para. [0045] of the originally filed specification. Claim 3 has been amended editorially. Care has been taken to avoid the introduction of new matter. Claims 8-27 are withdrawn. In view of the foregoing amendments and the following remarks, Applicants respectfully submit that all pending claims are in condition for allowance.

Priority

The Office Action acknowledges Applicants' claim for foreign priority based on an application filed in Japan on January 23, 2004. The Examiner contends that the Applicants have not filed a certified copy of JP 2004-016286 application, as required by 35 U.S.C. § 119(b).

The Applicants respectfully submit that the Examiner acknowledged the receipt of copies of certified copies of the priority documents from the International Bureau in the Office Action Summary (form PTOL-326) of the Office Actions dated February 11, 2008 and March 18, 2008. A Notification Concerning Transmittal of Copy of International Application as Published or Republished (PCT/IB/304) dated April 5, 2005 is submitted concurrently herewith. Accordingly, acknowledgement of foreign priority claimed under 35 U.S.C. § 119 is requested.

Claim Rejections Under 35 U.S.C. § 103

Claims 1-7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over JP2004-265844 ("JP '844) in view of Adhi et al., *Femtosecond Ultraviolet (248 nm) excimer laser process of Teflon (PTFE)*, Applied Surface Science, Vol. 218, 2003 (hereinafter Adhi). Pre-Grant Publication No. 2006/0251871 to Matsuda et al. ("Matsuda") will be relied on as a translation of JP '844. Applicants traverse.

An aspect of this invention, per amended claim 1, is a stretched porous polytetrafluoroethylene material (hereinafter stretched porous PTFE material) having a microporous structure including fibrils (fine fibers) and nodes connected to each other by the fibrils. The porous material is excellent in heat resistance, chemical resistance, workability, mechanical properties, and dielectric characteristics, such as, a low dielectric constant with an even hole diameter distribution. Stretched porous PTFE materials, such as, a stretched porous PTFE film are electrically insulating and moderately elastic and can recover elastically even when it is compressed.

Embodiments of the present application include applying the stretched porous PTFE material to, for example, technical fields of mounting members of semiconductor devices and members for inspection of electrical reliability to exhibit the excellent properties, as described above. More specifically, if patterned micro through-holes are formed in the stretched porous PTFE film, conductive portions are formed by selectively applying a conductive metal to wall surfaces of the through-holes.

Because it is often necessary to form a through-hole in a substrate for fabrication of an electronic part, the stretched porous PTFE material achieves electrical connection or forms an

electric circuit by filling the through-hole with a conductive material or forming a plated layer on the surface of the through-hole in another embodiment of the present application.

In a conventional hole-forming process, the stretched porous PTFE material has a porous structure composed of a micro-fibrous structure comprising extremely fine fibrils and nodes, thus it is difficult to form a microhole. In the conventional hole-forming process, the stretched porous PTFE material is easily destroyed, in addition, it is difficult to form a precise and fine hole.

In an embodiment of the present application, the stretched porous PTFE material has a microporous structure comprising fibrils and nodes connected to each other by the fibrils and is irradiated with a pulse laser beam having a pulse length of at most 10 picoseconds and a wavelength within a range of from 300nm to 900 nm to form a microhole having a hole diameter greater than an average pore diameter of the stretched porous PTFE material without destroying the microporous structure due to fusion of the fibrils by heat generated by the irradiation, or the like.

Since the stretched porous PTFE material is a very soft stretched porous PTFE film, an embodiment of the present application works with film that is supported on a support and wrought when it is abraded by irradiation of a pulse laser beam. An aspect of the present invention includes an abrasion working process using, as the support, a support provided with a site (for example, a bore) that does not come into contact with the material to be wrought at a region corresponding to a target working region of the material to be wrought. According to this abrasion working process, particles dispersed by abrasion of the support do not damage the condition of the wrought surface even when the surface of the material to be wrought is being irradiated with the specific laser beam.

The Office Action asserts that Masuda teaches a porous expanded polytetrafluoroethylene (ePTFE) material having a thickness of 10 to 200 microns with pore size of 0.1 microns and porosity of 60%. The Examiner contends that ePTFE comprises fibrils and nodes connected to each other by the fibrils. The Examiner avers that ePTFE of Matsuda has microholes of about 15 microns in diameter and the microholes extend through the thickness of the material. The Examiner contends that the microholes have a depth or a height ranging from 10 to 200 microns. The microholes are formed by laser drilling. The Office Action asserts that Masuda discloses that the ePTFE material have been supported by the PTFE films during ablation.

The Office Action acknowledges that Masuda does not specifically disclose the use of femtosecond lasers to perform ablation of ePTFE material. The Office Action relies on Adhi in an attempt to cure the admitted deficiencies of Masuda asserting that Adhi teaches femtosecond lasers that allow the PTFE material to be ablated at very high precision and without damaging surrounding areas because of heat influence. The Examiner contends that Adhi discloses that the femtosecond laser has a pulse length of 380 fs. The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the femtosecond lasers to make the microholes within the ePTFE of Masuda to provide the microholes within high precision and without damaging surrounding areas of the material because of heat influence. The Examiner concludes that Masuda as modified by Adhi used the same femtosecond lasers to perform ablation of the ePTFE material as Applicants. The Examiner concludes that the microstructure structure of the wall surface of the microhole would be substantially inherently retained without being destroyed.

Paragraph [0065] of Matsuda states:

> As for the method of forming through holes in the film thickness direction at specific positions of the porous film, there are methods such as a

> chemical etching method, a pyrolysis method, an abrasion method using laser beams or soft X-ray irradiation, an ultrasonic wave method, for example. When a porous PTFE film made by the expansion method is used as the base film, preferable methods are the ultrasonic wave method and a method in which synchrotron radiation rays or laser beams ***with a wavelength of 250 nm or less are irradiated*** (*emphasis added*).

Matsuda and JP '844 fail to disclose or suggest, at a minimum, "...a microporous structure comprising fibrils and nodes connected to each other by the fibrils is formed in the stretched porous polytetrafluoroethylene material by irradiation of a pulse laser beam having a pulse length of at most 10 picoseconds and ***a wavelength which is within a range of from 300nm to 900 nm***," as recited by amended claim 1.

Adhi states on pg. 18:

> A fs UV excimer laser (model LLG-500 fs; Lambda Physik and Laser Laboratorium, Gottingen, Germany) was used for processing the 50 μm thick PTFE films (Good Fellow; absorption coefficient $\alpha_{248} = 158\ cm^{-1}$, density 2.2 g/cm^3). ***The output from the fs excimer laser ($\lambda = 248$ nm***, tp ~ 380 fs and energy = 15mJ per pulse) passes through the beam delivery system with reflective optics, a metal mask and the focusing lens (f = 20cm) before it is incident onto the PTFE samples (*emphasis added*).

Adhi fails to disclose or suggest, at a minimum, "...a microporous structure comprising fibrils and nodes connected to each other by the fibrils is formed in the stretched porous polytetrafluoroethylene material by irradiation of a pulse laser beam having a pulse length of at most 10 picoseconds and ***a wavelength which is within a range of from 300nm to 900 nm***," as recited by amended claim 1.

Matsuda states in Paragraph [0096]:

> Subsequently, a tungsten sheet, in which openings were formed at uniform sequences by an opening area ratio of 9 %, at an opening diameter of 15 μmφ, and at a pitch of 80 μm, was placed on one side of the laminated body and an irradiation of synchrotron radiation rays was performed so that through holes were formed in the film thickness direction and equally

> arranged at a hole diameter of 15 μmφ and at pitches of 80 μm (*emphasis added*).

Thus, Matsuda does not disclose or suggest that the stretched porous polytetrafluoroethylene material has been supported on a support, as required by amended claim 1.

Adhi is *silent* regarding whether the stretched porous polytetrafluoroethylene material has been supported on a support, as required by amended claim 1. Contrary to the Examiner's assertions, although the PTFE of Adhi has a density of 2.2 g/cm^3, the PTFE is <u>not</u> stretched.

As Matsuda (JP '844) and Adhi do not disclose the same microhole-formed stretched porous PTFE material as disclosed by the present inventors, and even if combined still fail to disclose or suggest the elements recited by amended claim 1, the combination of Matsuda (JP '844) and Adhi does not render the microhole-formed stretched porous PTFE material as recited by amended claim 1 obvious.

Claims 1-7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,306,491 to Kram et al. ("Kram") in view of Adhi.

The Office Action asserts that Kram teaches a porous expanded polytetrafluoroethylene (ePTFE) material having a thickness of 0.3 mm with pore sizes ranging from 0.5 to 10 microns. The ePTFE comprises fibrils and nodes connected to each other by the fibrils and have microholes of about 200 microns in diameter. The Examiner contends that the microholes extend through the thickness of the material. The Examiner avers that the microholes have a depth or a height of 300 microns and are formed by laser drilling. The Office Action asserts that Kram teaches that the ePTFE has a porosity of 67% as evidenced by U.S. Patent No. 3,953,566 to Gore that is incorporated herein by reference.

The Office Action acknowledges that Kram does not specifically disclose the use of femtosecond lasers to perform ablation of ePTFE material. The Office Action relies on Adhi in an attempt to cure the admitted deficiencies of Kram.

The laser discussed in Kram is a carbon dioxide laser that forms an aqueous liquid-fillable component in the material where the material is subjected to a carbon dioxide laser-drilling process to create an ordered plurality of holes along z-axis of material. It is well known by persons skilled in the art that the wavelength of the carbon dioxide laser is a wavelength within an infrared range. Kram does not disclose or suggest, at a minimum, "...a pulse laser beam having a wavelength which is within a range of from 300 nm to 900 nm," as recited in amended claim 1.

The Examiner asserts that Adhi teaches that femtosecond lasers allow the PTFE material to be ablated to a very high precision without damaging surrounding areas because of heat influence. The Examiner contends that Adhi discloses that the femtosecond laser has a pulse length of 380 fs. The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the femtosecond lasers to make the microholes within the ePTFE of Kram to provide the microholes within high precision and without damaging surrounding areas of the material because of heat influence. The Examiner concludes that Kram as modified by Adhi used the same femtosecond lasers to perform ablation of the ePTFE material as the Applicants, therefore, the Examiner contends that the microstructure structure of the wall surface of the microhole would be substantially inherently retained without being destroyed.

The Examiner acknowledges that neither Kram nor Adhi teaches or suggests the use of a support during ablation. The Examiner contends that it is a product-by-process limitation not yet

shown to produce a patentably distinct article. The Examiner concludes that the article of Kram as modified by Adhi is identical to or only slightly different than the claimed article prepared by the method of the claim because both articles are formed from the same materials, having structural similarity.

The Office Action states that it is noted that if the Applicants intend to rely on Examples in the specification or in a submitted Declaration to show non-obviousness, the Applicants should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with Kram as modified by Adhi.

The support recited in claim 1 imparts distinctive structural characteristics, such as, the microporous structure of the wall surface is substantially retained without being destroyed in the claimed microhole-formed stretched porous PTFE material, and the Examiner must give patentable weight thereto. Fig. 1 of the present application shows a scanning electron microphotograph (SEM, about 800 magnifications) illustrating a section of a microhole (through-hole) where the microhole a microhole is small in hemming bottom and excellent in sectional form (*see, e.g.*, pg. 18, lines 9-21 of the originally filed specification).

Neither Kram nor Adhi, individually or combined, disclose or suggest, "...the microhole is formed by irradiating the stretched porous polytetrafluoroethylene material with the pulse laser beam in a state that the stretched porous polytetrafluoroethylene material has been supported on a support, and at this time, using, as the support, a support provided with a site coming into no contact with the stretched porous polytetrafluoroethylene material at a region corresponding to a target region of the stretched porous polytetrafluoroethylene material, in which the microhole is formed," as recited in amended claim 1.

Claims 1-7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,409,764 to White et al. ("White") in view of Adhi.

The Office Action asserts that White teaches a porous expanded polytetrafluoroethylene (ePTFE) material having a thickness of 0.005 to 0.01 inches with an average pore size of 1.7 microns where the ePTFE comprises fibrils and nodes connected to each other by the fibrils. The Examiner contends that ePTFE has microholes of about 300 microns in diameter and the microholes extend through the thickness of the material. The Examiner avers that the microholes have a depth or a height from 0.005 to 0.01 inches. The Examiner asserts that the microholes are formed by laser drilling. The Examiner relies on the teachings of Gore that is incorporated by reference in White to evidence that the ePTFE has a porosity of 67%.

The Office Action acknowledges that White does not specifically disclose the use of femtosecond lasers to perform ablation of ePTFE material. The Office Action relies on Adhi in an attempt to cure the admitted deficiencies of White. The Examiner contends that Adhi discloses that the femtosecond laser has a pulse length of 380 fs. The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the femtosecond lasers to make the microholes within the ePTFE of White motivated by the desire to provide the microholes within high precision and without damaging surrounding areas of the material as a result of heat influence. The Examiner concludes that the microstructure structure of the wall surface of the microhole would be substantially inherently retained without being destroyed.

White describes pores of 300 micrometer diameter that are constructed in the sheets using laser etching. Further, White is *silent* regarding the support for supporting the ePTFE sheet.

Adhi fails to disclose or suggest a pulse laser beam having a wavelength that is within a range of from 300nm to 900nm, as required by amended claim 1. Further, Adhi is *silent* regarding the support for supporting the ePTFE sheet.

As White and Adhi do not disclose the same microhole-formed stretched porous PTFE material as disclosed by the present inventors, and even if combined still fail to disclose or suggest the elements recited by amended claim 1, the combination of White and Adhi does not render the microhole-formed stretched porous PTFE material as recited by amended claim 1 obvious.

Withdrawal of the foregoing objections is respectfully requested.

Double Patenting

Claims 1-7 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2 of copending Application No. 10/551,459 ("the '459 patent") in view of Adhi.

These rejections are traversed, and reconsideration and withdrawal thereof respectfully requested.

The obviousness-type double patenting rejections should be withdrawn because neither the claims of the '459 patent nor Adhi suggest a microhole-formed stretched porous polytetrafluoroethylene material, characterized in that a microhole having a hole diameter greater than an average pore diameter of a stretched porous polytetrafluoroethylene material having a microporous structure comprising fibrils and nodes connected to each other by the fibrils is formed in the stretched porous polytetrafluoroethylene material by irradiation of a pulse laser beam having a pulse length of at most 10 picoseconds and a wavelength which is within a range

of from 300nm to 900 nm, and the microporous structure of the wall surface of the microhole is substantially retained without being destroyed, as required by amended claim 1.

Conclusion

In view of the above amendments and remarks, Applicants submit that this application should be allowed and the case passed to issue. If there are any questions regarding this Amendment or the application in general, a telephone call to the undersigned would be appreciated to expedite the prosecution of the application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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International application No. PCT/JP2005/001051	International filing date *(day/month/year)* 20 January 2005 (20.01.2005)	Priority date *(day/month/year)* 23 January 2004 (23.01.2004)
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The International Bureau transmits herewith the following documents:

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